Published in final edited form as:

J Plast Reconstr Aesthet Surg. 2018 August ; 71(8): 1123–1128. doi:10.1016/j.bjps.2018.05.041.

Internal mammary usability as recipient vessels in DIEP breast reconstruction in the setting of previous radiation

William Leppard,

Division of Plastic Surgery, Medical University of South Carolina, Charleston, SC 29425, United States

Thomas Pomposelli,

Division of Plastic Surgery, Medical University of South Carolina, Charleston, SC 29425, United States

Eric I Chang,

Institute for Advanced Reconstruction at the Plastic Surgery Center, Shrewsbury, NJ 07702, United States

Ahmed Suliman, and

Division of Plastic Surgery, University of California, San Diego, San Diego, CA 92103, United States

Fernando Herrera

Division of Plastic Surgery, Medical University of South Carolina, Charleston, SC 29425, United States

Ralph H. Johnson Veterans Hospital, Charleston, SC, 29425, United States

Dear Sir,

Autologous breast reconstruction has become the standard of care over the last several decades. The recipient vessel for these patients with microvascular reconstruction has classically been the thoracodorsal (TD) artery. This artery has a reliable anatomic location and is often easily dissected and preserved when exploring the axilla as part of the oncological procedure.¹ Recent recommendations have supported the use of the Internal mammary (IM) vessels for free flap anastomosis. The IM vessel selection allows for better arterial inflow, medial breast mound placement, shorter pedicle length, and avoids axillary exploration with resulting scarring and lymphedema risk.^{2–4} Temple et al documented a 20% rate of IM vessel conversion rate in patients who had previously radiated breasts.⁴ The purpose of this study was to determine if pre-reconstruction radiation affects IM vessel usability in autologous breast reconstruction.

We performed a retrospective study of all patients undergoing unilateral or bilateral deep inferior epigastric perforator flap for breast reconstruction with previous radiation to the breast, from January 2006 to July 2011. Patient demographics, recipient artery used, and recipient vein size were recorded and analysed.

Two hundred eighteen DIEP flaps were performed in 154 patients (90 unilateral and 64 bilateral). All 154 patients received breast or chest wall radiation as part of their treatment

therapy prior to reconstruction. The mean age of our patient population was 51 years of age (range 31–74) with a mean body mass index (BMI) of 28 kg/m². Sixty-one patients (40%) had immediate breast reconstruction. The remaining 93 patients (60%) had a delayed breast reconstruction. Fifty-six patients underwent complete axillary dissections (26%). (Table 1)

The internal mammary artery (IMA) and vein (IMV) were used as the recipient vessels in 214 DIEP flaps (98%). The thoracodorsal vessels were used as recipient vessels in only 4 flaps (2.0%). The mean IMV diameter was 2.8 mm. The mean BMI of this group was 27.6 kg/m². The thoracodorsal vessels were used on two left-sided breast flaps and 2 right-sided breasts flaps. The mean TD vein diameter was 2.75 mm. There was no significant difference seen between groups ($p = 0.49$). (Table 2)

The thoracodorsal vessels have conventionally been utilized as recipient vessels for autologous breast reconstruction due to the convenience of exposure with concurrent axillary dissection.² Saint-Cyr et al. analysed 1483 free flap reconstruction cases and found the TD vessel was selected more frequently in cases requiring axillary dissection and immediate reconstruction. IM vessels were selected more often in cases with prior axillary dissection, preoperative radiation, and sentinel node biopsy. Given the increasing use of sentinel node biopsy, fewer axillary dissections are being performed.³ With the axillary contents remaining undisturbed, dissection of IM vessels has become more frequently used for recipient site anastomosis. Saint-Cyr et al. showed a 60% rate of sentinel node biopsy in 2004, marking a large increase from 15% in 2000. This correlates with a decrease in TD vessel utilization and increase in IM vessel utilization in their study.³

The IM and TD vessels range in size from 1 to 2.5 mm in arterial diameter and 1 to 4 mm in venous diameter with the majority of differences attributed to flow rates.⁵ According to Lorenzetti et al., mean IM arterial blood flow rate is 25 mL/min (range 15–35 mL/min), while mean TD arterial rate was found to be 5 mL/min (range 2–8 mL/min). This high-pressure flow in the IM recipient vessel allows for the option of antegrade or retrograde anastomosis.⁵ Saint-Cyr et al. found a conversion rate of 2.8% in TD vessels and 1.9% in IM vessels. They also determined that TD conversion rate was significantly associated with pre-operative radiotherapy and previous axillary dissection. IM conversion, however, was not significantly associated with any of these factors.³

According to our data, we identified only a 2% conversion rate for IM recipient vessels. The current literature conversion rates for IM vessels range from 2% to 7%.^{2,3} However, these studies included patients that had not received preoperative radiation. However we have several limitations to our study. Due to the fact that our study is an observational retrospective study we cannot determine why the thoracodorsal artery was used in 4 cases. In one case an axillary dissection had been performed potentially exposing the TD vessel as a recipient artery. Therefore, it is very difficult to make any generalized conclusions about selection of TD over IM vessel from our study. Our study did point out that the IM vessels are more often of adequate quality than previously suggested even in the face of previous radiation. For this reason the IM vessels should continue to be used as primary recipient vessels in autologous breast reconstruction with previous radiation. In the event of poor vessel quality or intra-operative difficulties, the TD vessels should be the alternative option.

References

1. Banwell M, Trotter D, Ramakrishnan V. The thoracodorsal artery and vein as recipient vessels for microsurgical breast reconstruction. *Ann Plastic Surg* 2012;68(5):542–3.
2. Moran SL, Nava G, Benham AH, et al. An outcome analysis comparing the thoracodorsal and internal mammary vessels as recipient sites for microvascular breast reconstruction: A prospective study of 100 patients. *Plast Recon Surg* 2003; 111 (6):1876–82.
3. Saint-Cyr M, Youseff A, Bae HW, et al. Changing trends in recipient vessel selection in microvascular autologous breast reconstruction: An analysis of 1483 consecutive cases. *Plast Recon Surg* 2007; 119(7):1993–2000.
4. Temple CL, Strom EA, Youssef A, et al. Choice of recipient vessels in delayed TRAM flap breast reconstruction after radiotherapy. *Plast Recon Surg* 2005; 115(1):105–13.
5. Lorenzetti F, Kuokkanen H, von Smitten K, et al. Intraoperative evaluation of blood flow in the internal mammary or thoracodorsal artery as a recipient vessel for a free TRAM flap. *Ann Plast Surg* 2001;46:590–3. [PubMed: 11405356]

Table 1

Patient demographics.

Timing of flap	Patients	Mean age	Unilateral	Bilateral
Immediate	93	51	25	36
Delayed	61	49	65	28

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

Recipient vessels used and vessel diameter.

Group	Recipient vessels	Vein diameter (mm)	Axillary dissection	BMI (kg/m ²)
IAAA	214	2.8	55	28
TD	4	2.75	1	27.6